1983 ANNUAL REPORT

The Coordinating Committee of Maritime Electrical Utilities

presented to
The Council of
Maritime Premiers

RAPPORT ANNUEL 1983

Comité coordonnateur des entreprises d'électricité des provinces maritimes

présenté au
Conseil des premiers ministres
des Maritimes

Maritime Electric Company Limited

The New Brunswick Electric Power Commission

Nova Scotia Power Corporation

Maritime Electric Company Limited

La Commission d'énergie électrique du Nouveau-Brunswick

Nova Scotia Power Corporation

THE COORDINATING COMMITTEE OF MARITIME ELECTRIC UTILITIES

1983 ANNUAL REPORT

TO

THE COUNCIL OF MARITIME PREMIERS

March 5, 1984

Premier J. M. Buchanan
Premier R. B. Hatfield
Premier J. M. Lee

Sirs:

It is with pleasure that we, the members of the Co-ordinating Committee of Maritime Electric Utilities, submit our Annual Report.

The Co-ordinating Committee of Maritime Electric Utilities (CCMEU), having now completed its third full year of operation, feels that its existence has helped to promote and ensure full co-operation among the region's electric power utilities.

We also believe that CCMEU serves a useful role in identifying, discussing, and quantifying the benefits of such co-ordination for the Council of Maritime Premiers.

Respectfully,

J. H. Reynolds
Chairman, CCMEU
Maritime Electric Company Limited

D. G. Brown
Secretary, CCMEU
Nova Scotia Power Corporation

G. L. Titus
Member, CCMEU
New Brunswick Electric Power Commission

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1.0 SUMMARY OF FINDINGS

1.1 General

The committee feels that the terms of reference provided by the Council continue to be satisfactory and will result in the ability to provide valuable information to both the Council and the Utilities in matters relating to the efficient regional development and operation of the Maritime Electric Power Systems.

The individual Operating, Planning, and Research and Development Subcommittee reports provide an overall appreciation of Committee results.

Highlights from these subcommittee reports reveal the following:

1.2 Regional Operations Subcommittee Report

The great benefits of interconnected operation of the member utilities were again demonstrated in 1983. The exchange of energy saved the Maritimes more than 27 million dollars in the cost of supplying electrical loads. This is almost 2 1/2 times the savings realized during the previous year (1982). This increase results primarily from the Point Lepreau nuclear unit operating reliably for the full year, as well as a large increase in the price of heavy fuel oil in 1983, contributing significantly to the savings from energy exchanges. Additional benefits resulted from the joint ownership of Dalhousie Unit #2 by NB Power and Maritime Electric (PEI).

The coordination of generation and transmission system maintenance in the three utilities is receiving priority attention to ensure that the economic energy exchange opportunities are fully captured, making the best use of all Maritime resources. The new interchange agreement signed in January 1983 between Nova Scotia and New Brunswick will greatly facilitate the realization of the benefits of interconnected operation.

1.3 Regional Planning Subcommittee Report

The report summarizes the regional load forecast, load-resources review and generation expansion analysis carried out over the past year for the Maritime Utilities.

The load forecast is based on the forecasts of the individual utilities. Average annual growth rates over the fiscal years 1983/84 and 1999/2000 are expected to be 3.2% for energy and 3.1% for demand. Growth in total sales over the period of fiscal 1981/82 to 1982/83 has been slightly negative due to a drop in industrial load.

From a reliability viewpoint, the load-resources review indicates an adequate level of generation reserves in the Maritime Provinces until near the end of the century. Long-term economic studies show that costs can be reduced by early installation of nuclear and/or coal units. Work to date indicates an all-nuclear expansion

1.3 Regional Planning Subcommittee Report (Cont'd)

to be more economic than an all-coal expansion to meet the regional needs over the planning period. Further investigation may show a mix of nuclear and coal to be a more practical solution, but considerably more detailed analyses are required before firm conclusions can be drawn.

1.4 Regional Research and Development Subcommittee Report

The subcommittee is pleased to report a continuing development in the research and development communciations structures in all member utilities, enabling the sharing of research and development information as well as possible future pooling of resources for R & D activities.

A review of the current R & D activity reveals the following projects in each utility:

1.4.1 New Brunswick Power

- Sulphur oxides removal from stack gas
- Conversion of an existing unit to fluidized bed combustion
- Determination of the energy required to produce domestic hot water
- Grand Lake generating station aquaculture project
- Utilization of thermal station cooling water for hatchery aquaculture
- Development of a residential energy audit procedure
- Large flow measurements for dye dispersion techniques
- Condenser fouling monitor
- Chatham coal-water mixture demonstration
- Waste heat utilization - surface heated greenhouse
- Fish culture facility utilizing waste heat from the Mactaquac generating station

1.4.2 Nova Scotia Power

- Marginal cost based peak load pricing and load control study
- Atmospheric fluidized bed studies
- Coal-liquid mixtures
- Annapolis Tidal Project
- Wind generation experiment
- Waste heat utilization
- Osprey nesting on transmission lines
- Field testing of distribution equipment and line materials in a marine atmosphere
- Accelerated material evaluation of polymer insulators for transmission lines
- Development of a one-ton line service truck body

1.4 Regional Research and Development Subcommittee Report (Cont'd)

1.4.3 Maritime Electric (PEI)

- Wind energy conversion system
- Mount Pleasant PEI
- Wind test site - North Cape PEI
- Coal-liquid mixture combustion - Charlottown PEI

Future efforts of the committee are expected to concentrate in the development of joint R & D projects in which the research work and benefits are pooled amoung the 3 Maritime Utilities. Projects of regional interests include:

- Marine Corrosion Studies
- Load Management Studies
- Other Areas as Identified

Joint R & D activities of this type provide the opportunity for maximum benefits to be realized from the efforts of the Maritime Electric Utilities.

2.0 THE COMMITTEE

The membership of the Committee shall consist of one representative, and an alternate, from each of the electric utilities. Observers delegated by each Provincial Government and the Federal Government may attend Committee meetings.

2.1 Committee Membership

Mr. J. H. Reynolds, Chairman
President and C.E.O.
Maritime Electric Company Ltd.
P.O. Box 1328
Charlottetown, P.E.I.
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Mr. D.G. Brown, Secretary
Vice President - Planning
Nova Scotia Power Corporation
Post Office Box 910
Halifax, Nova Scotia
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Mr. G. L. Titus,
Assistant General Manager,
Planning & Development
New Brunswick Electric Power Comm.
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2.2 Observers To The Committee

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Secretary To The Executive Council
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Cabinet Secretariat
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E. Martin Warnes
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Electrical Energy,
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2.0 The Committee (cont'd)

2.3 Alternate Committee Members

F.C. MacLoon (Alt. Member)
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515 King Street
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P. H. Newcombe (Alt. Member)
General Manager
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Charlottetown, P.E.I.
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L.J. Sweett (Alt. Member)
Vice President - Operations
Nova Scotia Power Corporation
Post Office Box 910
Halifax, Nova Scotia
B3J 2W5

2.4 Committee Terms of Reference

The responsibility, structure, and operation of the Committee is intended to ensure a continuing high degree of cooperative effort among the electric utilities of New Brunswick, Nova Scotia, and Prince Edward Island in the development and operation of an economic and efficient interconnected regional electric power system.

Responsibilities of the Committee shall include:

(1) Development of coordinated load growth forecasts on an annual basis.
(2) Identification and evaluation of regional electric utility development opportunities.
(3) Development of optimum coordinated short and long range utility expansion plans.
(4) Coordination of operations of the three utility systems with the objective of minimizing total regional generation costs, and improving security of supply.
(5) Coordination of electric energy research and development, conservation and related activities of a regional nature.
(6) Provision of a regional focus for operations coordination with neighbouring utility systems.
(7) Such matters as may be referred to the committee by the Council.

The Committee shall meet at least quarterly with locations normally rotating among the three provinces.

The Committee shall submit a written report at least annually to the Council of Maritime Premiers.

2.0 The Committee (cont'd)

2.5 Subcommittee Membership 1983

2.5.1 Regional Operating Subcommittee

Chairman: W. A. Patterson
New Brunswick Electric Power Commission

Members: P. H. Newcombe
Maritime Electric Company Ltd.

W. V. Wallace
Nova Scotia Power Corporation

2.5.2 Regional Planning Subcommittee

Chairman: R. W. Brown
Nova Scotia Power Corporation

Members: J. L. Boomhower
Maritime Electric Company Ltd.

D. G. Hayward
New Brunswick Electric Power Commission

2.5.3 Regional Research and Development Subcommittee

Chairman: J. A. Lea
Maritime Electric Company Ltd.

Members: J. Kiuru
Nova Scotia Power Corporation

P. J. Whalen
New Brunswick Electric Power Commission

3.0 REGIONAL OPERATING SUBCOMMITTEE REPORT FOR 1983

Members:

W. A. Patterson - Chairman, NB Power

P. H. Newcombe MECL

W. V. Wallace NS Power

January, 1984

3.0 REGIONAL OPERATING SUBCOMMITTEE REPORT FOR 1983

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3.1 Summary

Interconnected operation of the member utilities demonstrated again in 1983 the great benefits of such operations. The exchange of energy saved the Maritimes more than 27 million dollars in the cost of supplying electrical loads. This is almost 2½ times the savings realized in 1982. It again does not include the benefits of the joint ownership of Dalhousie Unit No. 2 by N. B. Power and Maritime Electric (P.E.I.). The large increase results primarily from the Point Lepreau nuclear unit being in service, operating reliably for the full year. The large increase in the price of heavy fuel oil in 1983 contributed significantly to the savings from energy exchanges.

Activities were on-going in the coordination of generation and transmission system maintenance in the three utilities. The value of energy exchanges indicates that attention to these areas is essential to make the best use of all resources.

3.2 Recommendations

Co-ordinating the operation and maintenance of facilities will be a priority to ensure economic energy exchanges are fully captured. The necessity of this increases with the fourth Lingan unit being commissioned and the second Hydro-Quebec tie coming up to capacity. Training of System Operations is to be reviewed with an evaluation of a joint effort to enhance competence and co-operation of staff. Development of an Energy Control Centre in New Brunswick and Nova Scotia will be in liaison with the other members to ensure the needs of co-ordinated operation are met.

3.3 Terms of Reference for Regional Operating Subcommittee

The Regional Operating Subcommittee shall consist of at least one member from each of the utilities in the Maritime region. The Subcommittee will meet at least twice yearly and will report to the Coordinating Committee of the Maritime Electric Utilities (CCMEU) at least twice yearly.

The Regional Operating Subcommittee shall undertake to do the following:

(1) Monitor and report on activities within each utility with respect to changes in control and operating policy and practice.

(2) Review, at least annually, the operating policies and practices in effect in the different utilities and determine if there are benefits of intergrating different operational aspects of the utilities.

(3) Endeavour to determine the optimum dispatch of existing electrical energy resources on a regional basis including imports from outside the region and where beneficial, exports and report on any actions that the Subcommittee thinks could be beneficial to the utilities individually or collectively.

(4) Attempt to identify and report on possible savings due to allocation of hydro on a regional basis and possible methods of sharing benefits from such allocation.

(5) Submit minutes of Subcommittee meetings to the Secretary of CCMEU for distribution to CCMEU members and other Subcommittee members.

(6) Submit a proposed work program and an expected budget requirement to the CCMEU by June 1 of each year.

3.4 Benefits from Interconnected Operation

The great benefits of interconnected operations by the member utilities are realized with little public notice. One of these benefits being realized without full appreciation by the customers of the Interconnected Maritime Utilities is the avoidance of frequent power interruptions which, when experienced, are cause for attention, even national attention if the scope and duration is significant. Many other benefits are similarly unnoticed and difficult to ascribe a value. For example, the Maritime Utilities share in the supply of minute by minute generation reserve required to back up the supply to customers in the region. The amount of reserve and the cost would be much greater if each utility had to operate generation just to supply the reserve for its customers compared to the cost when the reserve requirements are shared. Operations are further co-ordinated by energy interchange, when opportunities arise, to efficiently carry out work on neighbouring facilities, avoiding costly construction set up.

The large, tangible benefits of interconnected operation are demonstrated by the benefits members realized in the exchange of energy. These benefits have regularly been great. The magnitude of these, in 1983, reached an all time high of 27.05 million dollars, 248% of the results in 1982. These benefits are savings realized by one utility purchasing less costly energy from a neighbour, plus the net revenue realized by the selling utility

because it was able to market energy that was surplus at the time. The results combine to represent savings in the Maritime Provinces of the 27 million dollars noted as benefits from the interconnected exchange of energy. The transactions are outlined below in some detail.

INTERCONNECTION TRANSACTIONS*

JANUARY 1, 1983 TO DECEMBER 31, 1983

Energy Transactions Between	Volume of Interchange (MWh)	Total Value of Transaction (1000 of $)	Benefits of Transactions (1000 of $)
N.B. Power to N.S. Power	766,000	21,750	9,850
N.S. Power to N.B. Power	151,000	4,070	2,800
N.B. Power to Maritime Elect. Ltd.	385,726	19,264	14,400
TOTAL	1,302,726	45,084	27,050

* Benefits for firm contract exchanges not included.

The marked increase in transactions and net benefits result from four principal factors occurring in the year:-

(1) The commissioning of the Point Lepreau nuclear unit by N. B. Power and its exceptionally high performance experienced since being placed in service. This has made lower cost energy available in New Brunswick for interconnection sales.

(2) The average cost of heavy fuel oil in 1983 was about 18% more than the cost of oil in 1982. This meant the savings from energy exchanges that resulted in displacing oil fired generation were significantly increased.

(3) The initial phase of the second interconnection between N. B. Power and Hydro-Quebec came into operation in April, 1983.

(4) N. S. Power's third Lingan coal fired unit came into production in the last quarter of the year and was placed in commercial operation in December.

It is forecast that energy exchange will further increase in 1984 with the growth in loads, the commercial operation of the fourth Lingan unit in Nova Scotia, and increased capacity in the Hydro-Quebec, NB Power Interconnection.

3.5 Generation Maintenance Scheduling

The members exchange generator maintenance scheduling plans to allow co-ordination of maintenance outages to economize on production costs and to ensure generation reserves are adequate. Data on the energy needs of the loads of member utilities with coincident generation is exchanged to indicate the available surplus energy or energy deficiencies.

This activity is growing in importance, especially to New Brunswick and Nova Scotia, to make use of transmission line capacity and energy surpluses that relate to high flows in the Saint John River, operability of Pt. Lepreau, coal-fired generators in New Brunswick and Nova Scotia, and the N. B. Power/Hydro-Quebec Interconnection.

3.6 Transmission System Maintenance

Work continues to more closely coordinate maintenance activities by way of exchange of data on apparatus and tools, also on the exchange of spare parts data. An investigation is starting on the merit of extending a computer inventory on spare parts from New Brunswick to Nova Scotia and Prince Edward Island. Personnel responsible for maintenance in member utilities and Saint John Civic Hydro have recently met on System Maintenance cooperation, including discussion of the on-line inventory of parts.

3.7 System Operation

3.7.1 Interconnection with PEI

Early this year, the supply from N. B. Power to Prince Edward Island was rearranged to connect to the alternate 138,000 volt line between New Brunswick and Nova Scotia to increase the security of supply and reduce the losses. The circuit was arranged so that it can now be connected to either of the two lines, albeit an interruption is required to make the change. It will avoid a long interruption, such as was required in January, 1982, following a severe snow and wind storm, which damaged one of the transmission lines.

3.7.2 Special System Protection Scheme

Transmission line loading in Southeastern New Brunswick during peak load conditions, coincident with large power flows to PEI required installation of controls to protect transmission lines between Salisbury and Moncton, N.B. The scheme installed provides

the automatic start and loading of the gas turbine generators at Moncton, N.B., and Borden, P.E.I., in the event one of the two lines between Salisbury and Moncton fault. This is to avoid overloading and damaging the remaining transmission line and avoiding the interruptions to customers in NB and PEI.

3.7.3 Training of System Operators

Consideration continues on the purchase of video programs for the training of System Operators. This program, available from Power System Technologists, prepared under the auspice of the New York Power Pool, may be jointly acquired to aid in the training of System Operators of Nova Scotia, New Brunswick, and Prince Edward Island. System Operator's functions increase in complexity with a corresponding increase in the consequence of error, making training and refresher studies more essential.

3.7.4 New Interconnection Agreement between NB Power and NS Power

This agreement came into effect in January, 1983. Transactions have thus been in accordance with the terms set out, providing a new basis for reserve sharing and continuing the basis for sharing benefits in the exchange of surplus energy.

ANNUAL REPORT

OF THE

PLANNING SUBCOMMITTEE

OF THE

COORDINATING COMMITTEE OF MARITIME ELECTRIC UTILITIES

JANUARY 1984

Members:

R.W. Brown - Chairman, NSPC

J.L. Boomhower MECL

D.G. Hayward NBEPC

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4.1 SUMMARY

This is the third annual report of the Planning Subcommittee to the Coordinating Committee of the Maritime Electric Utilities.

The report summarizes the Regional Load Forecast, Load-Resource Review and Generation Expansion Analysis carried out over the past year.

The Load Forecast is based on the Forecast of the individual utilities. Average annual growth rates over the fiscal years 1983/84 to 1999/2000 are expected to be 3.2% for energy and 3.1% for demand. Growth in total sales over the period fiscal 1981/82 to 1982/83 has been slightly negative due to a drop in industrial load.

From a reliability viewpoint, the Load-Resource Review indicates an adequate level of generation reserves in the Maritime Provinces until near the end of the century. The results are given in Tables 9, 10 and 11.

Long term economic studies show that costs can be reduced by early installation of nuclear and/or coal units. Work to date indicates an all nuclear expansion to be more economic than an all coal expansion to meet the regional needs over the planning period.

Further investigation may show a mix of nuclear and coal to be a more practical solution, but considerably more detailed analyses are required before firm conclusions can be drawn.

4.2 RECOMMENDATIONS

It is recommended that the Planning Subcommittee continue with the proposed activities for 1984 as outlined in section 4.6 of this report.

4.3 TERMS OF REFERENCE

The Regional Planning Subcommittee shall consist of at least one member from each of the utilities in the Maritime Region. The Subcommittee will meet at least twice yearly and will report to the Coordinating Committee of Maritime Electric Utilities (CCMEU) at least twice yearly.

The Regional Planning Subcommittee shall, through whatever mechanism it deems necessary, Task Force appointment, consultant acquisition, etc., (subject to approval of CCMEU) undertake to do the following:

1. Prepare a load forecast showing the power and energy requirements of the region for approximately two decades. This load forecast shall be reviewed and updated, if necessary, annually.
2. Obtain the plans of the individual utilities and combine them to prepare a regional load-resource balance.
3. Identify possible benefits through short term deferral and/or advancement of provincially scheduled units and will so notify the CCMEU.
4. (a) Considering all feasible regional alternatives, prepare an optimum long term generation expansion plan (including major transmission when necessary) without regard to individual utility boundaries and without regard to proposed provincial units which have not been committed to construction. The development of any optimum expansion plan will always start with the then existing and committed facilities of the three Systems.

4.3 TERMS OF REFERENCE (Cont'd)

(b) Prepare a report comparing the optimum regional expansion plan with the sum of the individual expansion plans and report its findings to the CCMEU.

5. Periodically assess the potential for imports from outside the region or exports outside the region, the constraints imposed by existing transmission system limitations and will recommend the need or otherwise for studies of incrementing transmission capacity.

6. Submit a proposed work program and an expected budget requirement to the CCMEU by June 1 of each year.

4.4 WORK PROGRAM FOR 1983

- Produce a Regional Load Forecast
- Continue development of a regional generation expansion plan including consideration of the benefits of an advancement or deferral in the timing of specific generating units.
- Produce the load resource balance for generation existing and under construction.
- Prepare a formal report(s) on the work done by the Planning Subcommittee during the year.

All work to be carried out by utility personnel without the use of consultants.

4.5 ACHIEVEMENTS FOR 1983

4.5.1 Maritime Utilities Load Forecast

The individual Maritime utilities forecasts have been combined in Table 1 to give the regional load forecast. Average annual growth rates for the period 1983/84 to 1999/2000 are 3.2% for energy and 3.1% for peak demand. These are slightly below the 3.4% energy and 3.2% demand growth rates forecast for the same period last year.

Since the individual utility annual peak loads do not necessarily all occur at the same hour of the year, their arithmetic sum is usually greater than the annual peak load demand of the integrated regional system. A five year history of the hourly loads of each of the three utilities has been analyzed to determine the expected relationship between the forecast regional coincident peak load and the arithmetic sum of the individual utility peak loads. The results are shown in Table 2.

Table 3 summarizes the expected long term growth in energy sales by sector. Although over the past year there was growth in the domestic and commercial sectors, the drop in the Industrial sector was sufficient to cause a slight decrease in total sales. Between 1982/83 and 1999/2000 the forecast annual growth rate in total sales is 3.4%.

Tables 4 and 5 show respectively the regional monthly coincident peak demand and energy forecasts.

4.5 ACHIEVEMENTS FOR 1983

4.5.1 Maritime Utilities Load Forecast (Cont'd)

With all the uncertainties in the future variables which could effect the growth in electricity consumption, the forecast must be frequently updated, and can only act as a guide to utility planning.

4.5.2 Regional Load and Resources Review

The Load and Resource Review is intended to examine the ability of the regional utilities generating facilities to reliably meet the anticipated future demands of the customers.

4.5.2.1 Load Requirements

To allow for maintenance and account for forced or unexpected outages of generating units, the total generating capacity installed in the region must be greater than the regional load. This excess of generation over expected load is known as reserve. The load requirement to be met in the region consists of the forecast load in Table 1 plus a specified amount of reserve.

4.5.2.2 Resources

The generation resources are comprised of the total generation capabilities from both existing generating stations and those under construction. Retirement of older plant through time is also taken into consideration. Listings of the resources are given by

4.5.2.2 Resources (Cont'd)

Province in Tables 6, 7 and 8. The resources consist of a mix of hydro, coal fired thermal, or fired thermal, gas turbine and nuclear generation.

4.5.2.3 Reserve Criteria

The present New Brunswick policy is to use two reserve criteria in the assessment of the ability of the generation to reliably serve the load. For the purpose of this regional examination, these criteria have been applied to the combined NB, NS and PEI systems.

4.5.2.3.1 Reservice Criterion for Peak Electrical Capability

The power reserve criterion for Peak Electrical capability requires that the total generating capacity available in each month be able to supply the load during the peak hour of the month with a surplus equal to 20% of the forecast firm load or the capacity of the largest unit, whichever is larger. To meet this criterion thermal and hydro generating units are considered available at their full rated capabilities.

4.5.2.3.2 Reserve Criterion for Sustained Electrical Capabilities

The reserve criterion for sustained electrical capability requires that the NB, NS and PEI systems jointly be able to withstand the continuous loss of the largest unit in the interconnected area. Under such reserve sharing arrangements, it is usual that the capacity of this largest unit not exceed about 10% or the combined load of the participants. Because of the 230 MW of participation sales from the Point Lepreau nuclear unit, a unit loading of 410 MW will be relied upon within the New Brunswick system from that unit.

4.5.2.4 Solution Procedure

A comparison is made between the generation resources and the Load Required for each month of the study period. A surplus or deficit in the capability to supply is determined on both the reserve for the peak electrical capability and the reserve for the sustained electrical capability.

4.5.2.4.1 Peak Electrical Capability Assessment

The required reserve for peak capability is added to the peak forecast load to determine the total peak load that would have to be

4.5.2.4.1 Peak Electrical Capability Assessment (Cont'd)

met. This total load is compared with the sum of the generation supplies available from hydro, nuclear and fossil units to determine the surplus or deficit. In doing this calculation all generating units are considered to be available at their full net rated capability as given in Tables 6, 7 and 8. The results of this assessment are presented in Table 9.

4.5.2.4.2 Sustained Electrical Capability Assessment

Assessment of the sustained electrical capability of the system examines the ability of the generation to meet, during every hour of each month, the forecast load plus the required sustained reserve. For this assessment nuclear and fossil units are assumed available at full rated capacity 100% of the time.

Low water conditions are utilized in determining a system capability to meet a sustained energy demand.

4.5.2.4.2 Sustained Electrical Capability Assessment (Cont'd)

The available storage water is regulated in a manner to maximize the benefits on the system. The results of the sustained electrical capability assessment are given in Table 10.

The load resource balance of the NB, NS and PEI systems has been carried out for each month of the year. This report provides only details of the peak load month in each year, since this condition has been used to define the system surpluses and deficiencies and hence indicates from a reliability viewpoint when new generation is required.

For the purposes of determination of both the peak and sustained reserve capabilities the largest unit in the region is as follows:

1. Until 1991/92 - Point Lepreau at 410 MW
2. After 1991/92 - Point Lepreau at 640 MW

The generation additions assumed in the load and resources review are given in Table 11.

4.5 ACHIEVEMENTS FOR 1983

4.5.3 Regional Generation Alternatives

The work load of the Planning Subcommittee increased substantially over the past year. A very considerable effort has been devoted toward the examination of many long term generation expansion alternatives. The objective is to develop an economic, practical, and financially attractive expansion plan or plans under the assumption that the three utilities are operated as one.

Having developed the regional plan(s), the intent is to compare the results with the sum of the present individual utility plans and thus identify any significant potential savings resulting from a more integrated approach to utility planning and operation.

The approach to the subject has been to examine the problem first in a simplistic manner and then to increase the depth and detail of the analysis to the extent necessary to draw sound conclusions.

Some interesting observations have been made on the work to date.

Based on the assumptions used, they are as follows:

- Although from a reliability viewpoint the load-resources review indicated an adequate level of generation reserves in the Maritime Provinces until near the end of the century, the long term economic studies show that costs can be reduced by early installation of nuclear and/or coal units.

4.5 ACHIEVEMENTS FOR 1983

4.5.3 Regional Generation Alternatives (Cont'd)

- An all nuclear expansion appears more economically attractive than an all coal expansion to meet the regional generation needs over the planning period.

- Further investigation may show a mix of nuclear and coal to be a more practical solution.

- The results are very sensitive to the assumed price of coal and capital cost of nuclear generation.

It must be stressed that although the above observations arise from the work to date, a much more detailed analysis must be carried out before firm conclusions can be drawn.

4.6 PROPOSED ACTIVITIES FOR 1984

1. Continue development work on a regional generation expansion plan:

   a) Examine and where appropriate choose analytical techniques and programs to analyze:
      - Major transmission transfer capability and losses
      - Level of reliability
      - The present method of dispatching NB/PEI and NS
      - The potential improvements of integrated dispatch

   b) Review all major assumptions used and revise where necessary.

2. Produce the regional load forecast.

3. Produce the load resource balance for generation existing and under construction.

4. Write a formal report(s) on the subcommittee annual activities.

Initial expansion planning will consider the economic and financial implications of conventional coal and nuclear additions until a preliminary base plan is developed. The resulting plan will then be compared to alternatives such as pumped storage, conversions, hydro additions and variations in the tie capabilities external to the region.

While any specific expansion plan may demonstrate an economic preference over some alternate plan, such plan may be financially impractical to an individual utility or even an integrated utility concept.

4.6 PROPOSED ACTIVITIES FOR 1984

It is important to note that the development of expansion plans on a regional basis is a complex and time consuming exercise. It is unlikely that much progress will be made beyond the examination of conventional coal and nuclear alternatives over the coming year.

TABLE 1

MARITIME ELECTRIC UTILITIES

LOAD FORECAST

Fiscal Year	System Net Gwh*	Peak Hourly MW
1983-84	15840	2866
84-85	16554	2950
85-86	17278	3067
86-87	17943	3172
87-88	18531	3272
88-89	19121	3379
89-90	19671	3477
90-91	20244	3583
91-92	20854	3694
92-93	21457	3802
93-94	22074	3914
94-95	22725	4031
95-96	23382	4149
96-97	24061	4272
97-98	24772	4396
98-99	25500	4527
99-2000	26252	4662

Total Period Averge Annual Growth Rate:

Gwh = 3.2%

MW = 3.1%

* Includes System Losses

TABLE 2

MARITIME ELECTRIC UTILITIES

COINCIDENT PEAK LOAD FORECAST (MW)

FISCAL YEAR	N.B.	N.S.	P.E.I.	TOTAL	COINCIDENT REDUCTION	COINCIDENT LOAD
1983-84	1669	1161	96	2926	60	2866
84-85	1729	1188	98	3015	65	2950
85-86	1789	1250	100	3139	72	2067
86-87	1849	1297	103	3249	77	3172
87-88	1902	1344	105	3351	79	3272
88-89	1958	1395	108	3461	82	3379
89-90	2009	1442	111	3562	85	3477
90-91	2060	1496	114	3670	87	3583
91-92	2112	1557	116	3785	91	3694
92-93	2161	1616	119	3896	94	3802
93-94	2211	1679	121	4011	97	3914
94-95	2263	1744	124	4131	100	4031
95-96	2315	1811	126	4252	103	4149
96-97	2369	1881	129	4379	107	4272
97-98	2424	1953	131	4508	112	4396
98-99	2479	2029	134	4642	115	4527
99-2000	2536	2107	137	4780	118	4662

TABLE 3

MARITIME ELECTRIC UTILITIES

1983 LOAD FORECAST SUMMARY

(GWH)

SECTOR	FISCAL 1981-1982 ACTUAL	FISCAL 1982-1983 ACTUAL	FISCAL 1999-2000	AVERAGE ANNUAL GROWTH RATE 1983-2000
Domestic Sales	4226	4416	7121	2.9
Commercial Sales	3977	4042	6636	3.0
Industrial Sales	5679	4988	10111	4.2
Total Sales	13882	13446	23868	3.4

TABLE 4

MARITIME ELECTRIC UTILITIES

MONTHLY COINCIDENT PEAK DEMAND FORECAST (MW)

FISC. YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1984/1985	2502	2333	2172	2093	2121	2208	2369	2624	2950	2945	2810	2689
1985/1986	2598	2423	2253	2164	2194	2288	2458	2726	3067	3065	2926	2796
1986/1987	2684	2499	2321	2225	2257	2354	2536	2818	3171	3172	3029	2893
1987/1988	2763	2572	2387	2287	2318	2418	2610	2902	3267	3272	3124	2981
1988/1989	2851	2655	2462	2357	2389	2493	2693	2996	3374	3379	3228	3080
1989/1990	2933	2732	2532	2423	2456	2563	2770	3084	3472	3477	3321	3169
1990/1991	3021	2813	2609	2494	2528	2638	2853	3178	3576	3583	3424	3265
1991/1992	3113	2900	2689	2570	2606	2719	2941	3276	3688	3694	3531	3369
1992/1993	3205	2986	2768	2645	2681	2798	3028	3374	3796	3802	3635	3467
1993/1994	3296	3073	2852	2723	2759	2879	3118	3474	3909	3914	3743	3569
1994/1995	3396	3166	2936	2804	2841	2964	3212	3579	4025	4031	3856	3678
1995/1996	3494	3258	3022	2886	2924	3050	3306	3686	4144	4149	3970	3786
1996/1997	3598	3354	3113	2970	3010	3140	3405	3796	4267	4272	4088	3897
1997/1998	3703	3453	3205	3058	3098	3232	3505	3909	4393	4396	4207	4012
1998/1999	3813	3558	3302	3151	3193	3330	3610	4027	4525	4527	4333	4132
1999/2000	3928	3664	3402	3247	3290	3430	3717	4147	4661	4662	4462	4255

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TABLE 5

MARITIME ELECTRIC UTILITIES

MONTHLY ENERGY FORECAST (GWH)

FISC. YEAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
1984/1985	1383	1273	1187	1181	1199	1201	1342	1435	1612	1670	1521	1550
1985/1986	1444	1328	1238	1230	1250	1252	1401	1498	1682	1745	1590	1620
1986/1987	1499	1379	1285	1276	1295	1298	1454	1556	1748	1815	1653	1685
1987/1988	1549	1424	1326	1316	1336	1339	1501	1608	1806	1876	1709	1741
1988/1989	1597	1469	1368	1355	1376	1380	1549	1660	1865	1938	1766	1798
1989/1990	1644	1512	1406	1393	1417	1418	1594	1708	1918	1993	1817	1851
1990/1991	1691	1556	1447	1433	1457	1458	1640	1758	1975	2052	1872	1905
1991/1992	1741	1603	1491	1475	1500	1502	1689	1811	2034	2116	1929	1963
1992/1993	1792	1650	1533	1517	1544	1544	1738	1865	2093	2176	1984	2021
1993/1994	1842	1697	1578	1561	1588	1589	1788	1918	2153	2239	2042	2079
1994/1995	1897	1747	1625	1607	1633	1635	1842	1975	2216	2305	2102	2141
1995/1996	1951	1798	1672	1653	1681	1682	1894	2032	2281	2372	2163	2203
1996/1997	2008	1850	1720	1700	1730	1730	1950	2091	2347	2442	2226	2267
1997/1998	2067	1904	1772	1751	1781	1781	2008	2154	2416	2513	2291	2334
1998/1999	2128	1961	1825	1804	1834	1833	2066	2217	2487	2586	2357	2402
1999/2000	2190	2019	1879	1857	1889	1888	2128	2281	2560	2662	2427	2472

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TABLE 6

GENERATING STATION CAPABILITIES - NET MEGAWATTS[1] (MW)
EXISTING AND UNDER CONSTRUCTION
IN NEW BRUNSWICK

Hydro			Thermal & Nuclear			
Mactaquac	1	100	Grand Lake			
	2	105		5	5	
	3	103		6	5	
	4	110		7	13	
	5	107		8	57	
	6	109				
Beechwood	1	36	Chatham	1	11	
	2	36		2	20	
	3	43				
			Courtenay Bay	1	45	
Tobique	1	10		2	13	
	2	10		3	99	
				4	99	
Grand Falls	1	15				
	2	15	Dalhousie	1	102	
	3	15		2	183	2
	4	15				
			Coleson Cove	1	335	4
Milltown		4.1		2	310	3
				3	335	4
Sisson		8.5				
			Lepreau Nuclear	1	640	5
Musquash		5.2				
			Moncton	1	23	
			Grand Manan		3	
Total Hydro		846.8 MW	Total Thermal & Nuclear		2297 MW	

1 Net megawatt values are derived by subtracting station service requirements from Gross Megawatt Capability.

2 Dalhousie unit 2 capability is reduced by 20 MW to recognize the joint ownership arrangement with Maritime Electric of Prince Edward Island.

3 Coleson Cove Unit 2 available at 184 MW until November, 1985 and 310 MW thereafter because of participation sales.

4 Coleson Cove units 1 and 3 available at 198 MW each until November, 1985 and 335 MW thereafter because of participation sales.

5 Lepreau Nuclear available at 410 MW until Nov. 1, 1991 because of participation sales.

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TABLE 7

GENERATING STATION CAPABILITIES - NET MW
EXISTING AND UNDER CONSTRUCTION
IN NOVA SCOTIA

HYDRO	MW	THERMAL	MW
Avon	7	Glace Bay	93
Bear River	36[2]	Lingan 1	150
Black River	21	Lingan 2	150
Dickie Brook	2	Lingan 3	150[1]
Lequille	22	Lingan 4	150[1]
Mersey	42	Point Tupper 1	67
Roseway	1	Point Tupper 2	147
St. Margarets	9	Trenton L.P.	55
Sheet Harbour	10	Trenton 5	141
Tusket	3	Tufts Cove 1	85
Harmony	1	Tufts Cove 2	97
Wreck Cove	223	Tufts Cove 3	148
		Water Street	161
		Maccan	13
		Combustion Turbine	205
TOTAL HYDRO [3]	377	TOTAL THERMAL	1812

1 Under construction, due Commercial in 1984.

2 A 20 MW Tidal Unit owned by the Tidal Power Corporation is expected to be completed in April 1984. It's output has been netted from the system load.

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TABLE 8

GENERATING STATION CAPABILITIES - NET MW IN PRINCE EDWARD ISLAND

THERMAL	MW
Charlottetown	19.0
	19.0
	9.5
	7.2
	7.2
	3.8
	1.4
Borden	22.0
	12.8
Summerside	6.0
Dalhousie 2 (NBEPC Purchase)	20.0
TOTAL	127.9

TABLE 9

MARITIME ELECTRIC UTILITIES

LOAD & RESOURCE REVIEW

PEAK ELECTRICAL CAPABILITY CRITERION

PEAK LOAD MONTH

FISCAL YEAR APR/MAR	FORECAST LOAD MW	REQ'D RESERVE MW	REQ'D CAPACITY MW	THERMAL CAP MW	HYDRO CAP MW	GROSS NUCLEAR CAP MW	NUCLEAR PART, OR FUEL REPL MW	NET NUCLEAR CAP MW	TOTAL RESOURCE MW	SURPLUS DEFICIT MW
1984/1985	2950	588	3538	3197	1224	640	230	410	4831	1293
1985/1986	3067	611	3678	3597	1224	640	230	410	5231	1553
1986/1987	3172	632	3804	3597	1224	640	230	410	5231	1427
1987/1988	3272	652	3924	3597	1224	640	230	410	5231	1307
1988/1989	3379	673	4052	3580	1224	640	230	410	5214	1162
1989/1990	3477	693	4170	3567	1224	640	230	410	5201	1031
1990/1991	3583	714	4297	3567	1224	640	230	410	5201	904
1991/1992	3694	736	4430	3515	1224	640	0	640	5379	949
1992/1993	3802	758	4560	3507	1224	640	0	640	5371	811
1993/1994	3914	780	4694	3474	1224	640	0	640	5338	644
1994/1995	4031	804	4835	3459	1224	640	0	640	5323	488
1995/1996	4149	827	4976	3399	1224	640	0	640	5263	287
1996/1997	4272	852	5124	3379	1224	640	0	640	5243	119
1997/1998	4396	877	5273	3334	1224	640	0	640	5198	-75
1998/1999	4527	903	5430	3334	1224	640	0	640	5198	-232
1999/2000	4662	930	5592	3254	1224	640	0	640	5118	-474

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TABLE 10

MARITIME ELECTRIC UTILITIES

LOAD & RESOURCE REVIEW

SUSTAINED ELECTRICAL CAPABILITY CRITERION

PEAK LOAD MONTH

FISCAL YEAR APR/MAR	FORECAST LOAD MW	REQ'D RESERVE MW	REQ'D CAPACITY MW	THERMAL CAP MW	HYDRO CAP MW	GROSS NUCLEAR CAP MW	NUCLEAR PART, OR FUEL REPL MW	NET NUCLEAR CAP MW	TOTAL RESOURCE MW	SURPLUS DEFICIT MW
1984/1985	2950	295	3245	3197	868	640	230	410	4475	1230
1985/1986	3067	307	3374	3597	884	640	230	410	4891	1517
1986/1987	3172	317	3489	3597	821	640	230	410	4828	1339
1987/1988	3272	327	3599	3597	832	640	230	410	4839	1240
1988/1989	3379	338	3717	3580	846	640	230	410	4836	1119
1989/1990	3477	348	3825	3567	860	640	230	410	4837	1012
1990/1991	3583	358	3941	3567	875	640	230	410	4852	911
1991/1992	3694	369	4063	3515	889	640	0	640	5044	981
1992/1993	3802	380	4182	3507	905	640	0	640	5052	870
1993/1994	3914	391	4305	3474	920	640	0	640	5034	729
1994/1995	4031	403	4434	3459	935	640	0	640	5034	600
1995/1996	4149	415	4564	3399	950	640	0	640	4989	425
1996/1997	4272	427	4699	3379	966	640	0	640	4985	286
1997/1998	4396	440	4836	3334	981	640	0	640	4955	119
1998/1999	4527	453	4980	3334	999	640	0	640	4973	-7
1999/2000	4662	466	5128	3254	1016	640	0	640	4910	-218

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TABLE 11

GENERATION ADDITIONS ASSUMED
FOR
LOAD AND RESOURCES REVIEW

GENERATION ADDITION	YEAR ENDING MARCH
150 MW Lingan 3 Coal	1984
150 MW Lingan 4 Coal	1985
400 MW Coleson Cove Returned	1986
230 MW Lepreau #1 Returned	1992

RESEARCH AND DEVELOPMENT
IN THE
MARITIME ELECTRIC UTILITIES
1983 ANNUAL REPORT

Prepared by the

Research and Development Subcommittee

of the

Coordinating Committee of the Maritime Electric Utilities

Members:

J. A. Lea - Chairman, MECL

J. Kiuru N.S. Power

P. J. Whalen N.B. Power

November 1983

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5.1. EXECUTIVE SUMMARY

This third annual report of the Research and Development Subcommittee of the Co-ordinating Committee of Maritime Electric Utilities (CCMEU) covers the Subcommittee's activities during 1983.

The Subcommittee is pleased to report a continual development in the R&D communications structure in all member utilities.

During 1983 the Subcommittee continued to carry out its mandate as set forth in its Terms of Reference (Section 3), as well as carrying out a detailed review of the benefits of CEA R&D participation by member utilities. A summary of the Subcommittee's achievements for 1983 is shown in Section 5 of this report.

The reports on the status of R&D projects in the Maritime Electric Utilities (Section 7) are under continual review with updates scheduled on a semi-annual basis. Recommendations for pooling of resources and results are made whenever such activity will benefit the region.

5.2. INTRODUCTION

This is the third annual report of the Research and Development Subcommittee of the CCMEU which was formed in March 1982.

The summary of 1983 activities and the proposed activities for 1984 indicate a continuing increase and improvement in co-operative activity in which the benefits of R&D in the Maritime Electric Utilities are being shared among member utilities.

The contents of this report reflect the continued commitment by CCMEU and its member utilities to promote a regional approach to R&D within the Maritime Provinces.

5.3. TERMS OF REFERENCE

The Regional R&D Subcommittee shall consist of at least one member from each of the province-wide utilities in the Maritime region. The Subcommittee will meet at least twice yearly and will report to the Coordinating Committee of the Maritime Electric Utilities (CCMEU) at least twice yearly.

The Regional R&D Subcommittee shall undertake the following:

5.3.1 Report on all electric utility-related R&D activities that are currently underway in the Maritime provinces.

5.3.2 Set up procedures whereby it is informed of any individual utility initiatives in R&D activity and attempt to achieve regional interest and participation in these activities.

5.3.3 Promote and implement the free exchange of R&D project information, procedures and results in order to share the results of all R&D projects undertaken by each utility. Recommend joint projects when such co-operation would benefit the region.

5.3.4 Review current and planned R&D expenditures by the member utilities and to recommend how maximum regional benefit can be obtained from these expenditures; this would include, but not be limited to the recommending against duplication of R&D effort.

5.3. TERMS OF REFERENCE (cont'd)

5.3.5 Review the current and proposed R&D participation by member utilities in the CEA R&D program, and recommend actions which will enhance the regional benefit of these projects. This includes the possibility of joint proposals and joint bids on R&D contracts by member utilities.

5.3.6 Review R&D activity undertaken by utilities in Canada that is outside the umbrella of the Canadian Electrical Association and obtain the results of that activity for regional use.

5.3.7 Recommend to the CCMEU those R&D initiatives that the Subcommittee thinks should be taken within the region.

5.3.8 For projects which are identified by all member utilities to be of regional interest, but which cannot be funded by CEA or other R&D Funding, the Subcommittee shall request funding by the member utilities through the CCMEU.

5.3.9 Submit minutes of Subcommittee meetings to the Secretary of CCMEU for distribution to members of the CCMEU and its other Subcommittees.

5.3.10 Submit a proposed work program and an expected budget requirement annually to the CCMEU as directed.

5.4. WORK PLAN FOR 1983

5.4.1 Joint Bids and Proposals

Develop procedures for joint proposals and joint bids for possible R&D projects by several member utilities. This will require careful screening of project requests in order to determine potential regional benefits as well as joint participation capabilities.

5.4.2 Develop Joint R&D Projects

Develop proposals for suitable joint projects for the region for submission to the CEA R&D Organization.

5.4.3 Study of Regional R&D Priorities

Determine possible methods for conducting a study of regional R&D priorities (recommended by the Subcommittee in 1982) using only Subcommittee and member utility resources considering that no funding or external assistance is available.

5.4.4 Update of Utility R&D Activity

Continue to update reports of R&D activity in the member utilities.

5.4.5 Study Regional Representation on CEA R&D Subcommittees

Complete a study for the CCMEU evaluating the merits of regional rether than individual utility representation on various CEA REsearch and Development subcommittees. (Study begun in December 1982)

5.5. SUMMARY OF ACHIEVEMENTS - 1983

5.5.1 In December 1982, a study was begun to consider the merit of regional representation on the CEA R&D Subcommittee rather than individual utility representation as is now the case. The Committee completed during 1983, a review of the benefits associated with CEA R&D participation. As well, the Committee prepared a paper presented to CCMEU describing a mechanism for the reduction in manpower participation by 50%. In addition, the Committee carried out an assessment of the level of benefit that could be retained in the CEA R&D program while participating at a reduced level.

5.5.2 The Committee carried out an examination of activity, past and present in the area of research on Coal Beneficiation. The results of this review indicated a possible role for the Committee in further work in this area.

5.5.3 The Committee continued to update on a semi-annual basis, a survey of R&D activities within the region, in accordance with item 1 of the Terms of Reference. The latest results are contained in Section 7 of this report.

5.6.0 PROPOSED ACTIVITIES FOR 1984

5.6.1 Joint Bids and Proposals

Develop procedures for joint proposals and joint bids for R&D projects by several member utilities. This will require careful screening of project requests in order to determine potential regional benefits as well as joint participation capabilities. It is planned that project #3, identified in 5.6.2, be prepared using this format.

5.6.2 Develop Joint R&D Projects

Continue the investigation of, and if all members agree on need, develop proposals and budget estimates for possible regional R&D programs on items such as:

1. Pooling of Load Research and Load Management procedures and data.
2. Review of existing R&D projects now proposed or under way in the region to determine the possibility of pooling of resources and data.
3. Study of Benefits and Cost of Coal Benificiation in Maritime region.

5.6.3 Pooling of Results of Regional R&D Projects

Develop procedures for suitable pooling of data and results of projects of regional interest, including:

- Marine Corrosion Studies.
- Load Management Studies
- Other areas as identified.

5.6.4 Update of Utility R&D Activity

Continue to update reports of R&D activity in the member utilities, and provide a forum for discussion of projects being carried out in the region. The latest summary appearing in Section 7 of this report will be reviewed and updated in Spring and Fall 1984.

5.7. STATUS OF CURRENT R&D ACTIVITIES IN THE MARITIME ELECTRIC UTILITIES

5.7.1 New Brunswick Electric Power Commission R&D Projects

5.7.1.1 Sulphur Oxides Removal from Stack Gas

Objective - To investigate the feasibility of catalytic flue gas desulphurization techniques using various suitable elements.

Description - A catalytic flue gas desulphurization technique was evaluated based on the following reactions.

$$SO_2 + 1/2\ O_2 \xrightarrow{V_2O_5} SO_3 \qquad (1)$$

$$SO_3 + MO \longrightarrow MSO_4 \qquad (2)$$

Where M, represents various suitable elements, i.e.: calcium, magnesium, iron, aluminum, etc.

Project was conducted in co-operation with the University of New Brunswick Department of Chemical Engineering. Tests were performed on flue gas from Grand Lake #8 Unit, indicating that commercial vanadium phenoxide catalyst is effective in promoting conversion of SO_2 to SO_3 (reaction #1 above) under dirty flue gas conditions. Solid reactants including lime and fly ash were not effective in capturing the SO_2 formed within the reaction time available.

Further work is necessary to investigate catalyst life under dusty flue gas conditions and the effect of the physical structure of the CaO and/or MgO on the sulfation reaction (reaction #2).

Status - Completed June 1982.

Cost - $ 66,000

Funding - 100% CEA (Project #G212)

Contact - Phil Whalen (NBEPC)

5.7.1.2 Conversion of an Existing Unit to Fluidized Bed Combustion

Objective - To prepare a conceptual design and cost estimate for the conversion of Chatham #2 Unit to fluidized bed combustion.

Description - This project involved the preparation of a conceptual design and a detailed engineering cost estimate for boiler conversion to fluidized bed combustion. Conversion was identified as technically feasible with completion at an estimated cost of just over $12 million. Electrical output of the converted unit would be 14 megawatts. Annual operating cost in 1979 dollars were estimated at $2.7 million including labour, materials and fueling costs.

Status - Complete

Cost - $65,000

Funding - 100% CEA (Project #G105)

Contact - Dave Rankin (NBEPC)

5.7.1.3 Determination of the Energy Required to Produce Domestic Hot Water

Objective - 1) To determine the range of energy consumptions for representative samples of electric, oil, natural gas and propane water heaters.

- 2) To determine the interrelated effects of hot water consumption, storage temperature, flue gas losses and other parameters on the energy consumption and performance.

- 3) To determine and compare the effectiveness of energy utilization of water heaters using different energy sources.

- 4) To determine the range of user costs for domestic hot water.

Status - Complete May 1981.

Cost - $60,200

Funding - 100% CEA

Contact - Reg Gulliver (NBEPC)

5.7.1.4 Grand Lake Generating Station Aquaculture Project

Objective - To test the biological, technical and economic feasibility of intensive salmonoid aquaculture using warm water from the generating station.

Description - In co-operation with CEA, N.B. Department of Natural Resources and N.B. Coal, a pilot

facility has been established at the Grand Lake plant to investigate the feasibility of using plant cooling water output for aquaculture projects.

Status - Completed May 1981, further work undertaken.

Cost - $391,000

Funding - Shared by above agencies

Contact - John Mercer (NBEPC)

5.7.1.5 Utilization of Thermal Station Cooling Water for Hatchery Aquaculture

Objective - To determine the full potential for use of warm water in salmon and trout culture during incubation, hatching and early rearing stages.

Description - This project was established at Grand Lake plant as an extention of Project CEA #909U133, to more fully determine potentials for hatchery aquaculture. This project demonstrates the economic and biological feasibility of utilizing condenser cooling water for year round fish culture activities.

Status - Complete March 1983; results very promising.

Cost - $133,000

Funding - Jointly funded under CEA Project #006U192 by CEA, N.B. Power, and the Department of Natural Resources, N.B. Coal, N.B. Energy Secretariat, E.M.R Canada, N.B. Wildlife Federation and Fisheries and Oceans Canada.

Contact - John Mercer (NBEPC)

5.7.1.6 Development of a Residential Energy Audit Procedure

Objective - To develop energy audit procedures appropriate for low rise residential housing.

Description - This project includes both a review of existing programs being carried out in Canada and parts of the United States as well as a description of the steps to be undertaken to implement a residential audit program throughout the Province of New Brunswick.

Status - Complete

Cost - $45,000

Funding - 100% CEA

Contact - Reg Gulliver (NBEPC)

5.7.1.7 Large Flow Measurements by Dye Dispersion Techniques

Objective - Investigate the possibility of correlating dye dilution concentrations with flow measurements in large water flows.

Description - This technique of flow measurement has been demonstrated on a laboratory research scale and will be calibrated on the large flow system at Alden Research Labs in the United States.

Status - 25% Complete. Estimated completion date July 1984.

Cost - $20,000

Funding - 100% CEA

Contact - W. Davies (NBEPC)

5.7.1.8 Condenser Fouling Monitor

Objective - To assess the feasibility of on-line indication of tube fouling (CW side).

Description - This project involves the installation of a monitor on Coleson Cove #1 Condenser for the assessment of the on-line indication of tube fouling. Effectiveness on on-line ball cleaning systems will also be evaluated.

Status - 40% Complete. Estimated completion date March 1984.

Cost - $60,000

Funding - 100% CEA

Contact - R. Pickles (NBEPC)

5.7.1.9 Chatham Coal/Water Mixture Demonstration

Objective - To determine the practicality of burning coal/water mixtures as a direct replacement for heavy fuel oil.

Description - This is a joint project of the federal department of Energy Mines and Resources, Cape Breton Development Corporation and N.B. Power. CBDC is responsible for the preparation of the low ash, low sulphur slurry and N.B. Power will burn up to 3,000 tonnes in each of its Chatham #1 and #2 Units. The fuel contains approximately 70% coal, 29% water, and 1% additives with no oil content.

Status - 70% Complete. Estimated completion date Spring 1984.

Cost - $5,500,000

Funding - 100% Energy, Mines and Resources Canada

Contact - D. Rankin or P. Whalen (NBEPC)

5.7.1.10 Waste Heat Utilization - Surface Heated Greenhouse

Objective - To evaluate a unique application of power station cooling water to reduce heating costs of conventional greenhouses.

Description - This heating concept involves the distribution of a thin layer of water over the roof surface thereby creating a reduced temperature gradient between the inside and apparent outside temperatures. The water layer can be up to 75°F warmer than ambient air temperatures during winter months.

Status - 75% Complete. Estimated completion date Summer 1984.

Cost - $950,000

Funding - CEA, Energy, Mines & Resources Canada, N.B. Coal and N.B. Power

Contact - J. Mercer (NBEPC)

5.7.1.11 Fish Culture Facility Utilizing Waste Heat from the Mactaquac Generating Station

Objective - To develop a large scale Atlantic salmon hatching and early rearing facility using waste heat from a hydro electric generation station.

Description - Following a pilot scale demonstration in 1982, N.B. Power and the Federal Department of Fisheries are co-operating to develop a large scale Atlantic salmon hatching and early rearing facility at the N.B. Power Mactaquac generating station. The source of waste heat to be used is stator and bearing cooling water which is available from all units at an average of 60 to 70°F. The total flow of available warm water is estimated to be some 6,600 gallons per minute with all units operating. The facility includes an incubation building, a pipeline and distribution system for up to 6 enclosed ponds.

Status - 20% Complete. Estimated completion date mid-1985.

Cost - $1,000,000

Funding - N.B. Power and Fisheries and Oceans Canada

Contact - J. Mercer (NBEPC)

5.7.2 Nova Scotia Power Corporation R&D Projects

5.7.2.1 Marginal Cost-Based Peak Load Pricing and Load Control Study

Objective - To ascertain whether certain pricing and load control systems can, in fact, lead to more efficient utilization of NSPC's capital and energy resources at a net benefit to customers and Corporation;

- To investigate the theoretical background and applicability of marginal cost pricing concepts; and;

- To develop, in the process, modeling techniques for load and sales forecasting, as well as system and financial planning.

Description - The study deals with many subsidiary issues which are critical to the achievement of the objectives. Among these will be the cost effectiveness of metering and load control systems, sample selection techniques, corporate operating procedures, administrative feasibility of alternative rate designs and software system design.

Status - The project was started in April 1979 with initial studies relating cost of service, cost allocation, marginal cost, and load and sales forecasting, conducted with the help of consultants.

Equipment installation is in progress with a target date of early 1984 for computerized collection of metering data from over 800 sites throughout the

province covering all classes of service. Information on kW and VAR demand for every 15 minutes will be recorded. The data is collected using the telephone system to call each collector approximately every 5 days.

A time-of-use experiment for a sample of industrial and commercial customers is planned for 1984-85 subject to PUB approval. In addition, a load management experiment involving 50 domestic water heaters is planned for the same period.

Cost - $3,000,000 for equipment and external consulting.

- NSPC manhours not included in cost.

Funding - Total of $3,000,000 funded 80% by Federal government and 20% by Province of Nova Scotia.

Contact - Jack Kiuru (NSPC)

5.7.2.2 Atmospheric Fluidized Bed Studies

Objective - To build an atmospheric fluidized bed (AFBC) test rig and use it for investigation of corrosion and erosion of tubing materials in the combustor.

Description - NSPC is managing the project which includes the design, construction, commissioning and operation of the test rig with a bed size of 1 m. by 1 m. All in-bed and convection pass tubes will be

water-cooled, air-cooled or uncooled and the rig will generate no steam.

Combustion Engineering Canada Limited is involved in the construction of the rig proper while NSPC is responsible for the balance of the project. Expected completion of construction is spring 1983 with 10,000-hour test program to be completed early in 1986.

Status -

Cost -

Funding - Energy, Mines and Resources Canada

Contact - G. D. Lethbridge (NSPC)

5.7.2.3 Coal-Liquid Mixtures

Through its membership in the Coal-Liquid Mixtures (CLM) Working Group, NSPC is keeping up-to-date on current research, especially the increasing activity in the Atlantic Provinces.

Contact - Jack Kiuru (NSPC)

5.7.2.4 Annapolis Tidal Project

The pilot project of building a tidal power plant at Annapolis is being undertaken by the Tidal Power Corporation with NSPC as prime consultants. As of May, 1983 construction was on schedule and full operation was expected to commence in the summer of 1983.

On May 6, 1983 a construction trades strike halted all work and as of November 15 the strike is still in progress. Commissioning is expected to take place 2 to 3 months after work resumes.

The project employs the larger Stra-flo turbine ever built, a type that is being considered for the larger Fundy Tidal project. This plant is strictly experimental and will be instrumented to enable a wide range of data to be gathered. It will be remote-controlled from one of the NSPC power control centres. Unit size is approximately 17 MWe and the runner diameter is 7.6 m.

Cost - $46 million (estimated)

Funding - Federal Government (EM&R) $25 million

Contact - B. V. McDonald (NSPC)

5.7.2.5 Wind Generation Experiment

A windmill has been installed at Wreck Cove. The power generated can be fed into the 23 kV power system or be used to pump water into the Wreck Cove headrace. The windmill went into operation early 1981 but subsequent problems characterized by wide power swings have recently been corrected by the installation of a synchronous generator. A final report will be issued on completion of the project.

Cost - $1,425,000 (estimated)

Funding - Federal (EM&R) $600,000

- NSPC $825,000

Contact - B. V. McDonald (NSPC)

5.7.2.6 Waste Heat Utilization

An investigation was made concerning the possible use of thermal plant circulating water reject heat in a combined agriculture/ aquaculture complex. Findings to date suggest that this is not commercially viable for heating of greenhouses due to a low delta T but it may be suitable for fish rearing.

Status - A draft report was issued in September 1983.

Funding - Internal NSPC manpower resources.

Contact - D. K. Blamire (NSPC)

5.7.2.7 Osprey Nesting on Transmission Lines

Objective - To extend previous research in osprey nest relocation.

Description - New nest site criteria will be tested in a relocation experiment involving six nest sites in Nova Scotia. Based on the resulting behavioral observations, relocation methodology will be redefined and data will be collected on osprey population dynamics.

Status - Commenced October 1983 - Continuing

Cost - $71,085

Funding -	N.S. Power Corporation	$ 11,353
	N.S. Department of Lands & Forests	24,332
	St. Francis Xavier University	16,910
	CEA	18,490

Contact - T.P. Toner, Environmental Specialist (NSPC)

5.7.2.8 Field Testing of Distribution Equipment and Line Materials in a Marine Atmosphere

Objective - To evaluate corrosion of equipment in a marine atmosphere.

Description - A 25 kV line along Inverness Beach feeding summer cottages has been fitted with various components such as cutouts, lightning arrestors, epoxy arm, insulators, connectors, clamps, etc., to study the effect of salt contamination under normal operating conditions.

This will assist in material evaluation and selection of suitable materials for construction of distribution lines in sea coast areas.

Thirty-three distribution transformers have been purchased and painted with polyester finish. They are being installed in salt and industrial polluted areas

in Eastern and Western Zones. Three additional powder coated transformers will be installed as part of CEA R&D Project 78-94.

Status - Commenced 1983

Funding - NSPC in-house project

Contact - K. S. Mathur (NSPC)

5.7.2.9 Accelerated Material Evaluation of Polymer Insulators for Transmission Lines

Objective - To evaluate the effect of pollution on polymer insulators in a salt fog environment.

Description - NSPC is participating in this CEA R&D Project undertaken by IREQ (Hydro-Quebec). Six polymer insulators of three makes, Ohio Brass Hi-Lite, Ceraver Armourlite and Rosenthal Roderflex were installed hot by NSPC on L7011 in the Lingan area in November 1982. One unit of each make was equipped with a corona ring.

After 18 months of field experience, these insulators will be removed and compared to the accelerated aging obtained in the laboratory under simulated conditions.

Funding - $229,230 (CEA R&D Project No. 121-T-226)

Contact - Kevin Penney (NSPC)

5.7.2.10 Development of a One-Ton Line Service Truck Body

In 1983, the Atlantic Utilities have reached consensus on a standard one-ton line service body, including basic modular, overall length, width, height, compartment size and layout and options.

The next phase is to have detailed construction drawings completed for both aluminum and fiberglass bodies. The drawings and specifications will be circulated to manufacturers for cost estimates and to utility Management for final approval.

Funding - In-house co-operative project by the Atlantic Utilities.

Contact - J. F. Baird (NSPC)

5.7.3 Maritime Electric Company Limited R&D Projects

5.7.3.1 Wind Energy Conversion System - Mount Pleasant, P.E.I.

Objective - To confirm the theoretical performance predictions of an array of six large-scale Wind Energy Conversion Systems.

Status - Under review pending financial support

Cost - $5.0 million (estimate)

Funding - The proposal has been initiated jointly by Maritime Electric and the P.E.I. Energy Corporation.

Contact - J. A. Lea (MECL)

5.7.3.2 Wind Test Site - North Cape, P.E.I.

Description - This is a national facility available to Government and private industry for field testing of windmills. Laboratory facilities provide data acquisition for the determination of unit performance.

Status - In operation

Funding - Site is operated by Resource Ventures Ltd. under long term contract from the P.E.I. government with an annual operating grant from N.R.C.

MECL Involvement - MECL has agreed to purchase output on an "energy displacement" basis. MECL also provides technical assistance on an 'as required' basis.

Contact - J. A. Lea (MECL)

5.7.3.3 Coal Liquid Mixture Combustion - Charlottetown, P.E.I.

Objective - To determine the practicality of burning coal/water mixtures as a direct replacement for heavy fuel oil.

Description - This project is designed to investigate the practicaltiy and effectiveness of burning a Carbogel (coal/liquid) mixture in a utility boiler originally designed to burn oil. As well, the project will demonstrate the feasibility of production and delivery of Carbogel in sufficient quantities for combustion.

Further information to be gained from the project includes"

- transportation, storage and handling of Carbogel.
- modification to oil fired boilers
- combustion efficiency
- economic data

Status - 15 January to 1 April 1984

Cost - $4.5 million

Funding - Energy, Mines & Resources Canada, Maritime Electric Company, Limited, M.B.B. Mechanical Services Ltd., Cape Breton Development Corp.

Contact - R. O. Younker (MECL)

POOR

QUALITY

ORIGINAL